CLAIMS

1. Programmable adapter device between a higher level communication protocol supported by a higher level equipment (30) and at least one lower level communication protocol supported by the lower level automation equipment (40), the device comprising an adapter (20) fitted with a processing unit (21) capable of executing program instructions, a higher level interface (23) that can connect with a higher level interface (32) in the higher level equipment (30), and a lower level interface (24) that can connect with a lower level interface (42) on the lower level equipment (40), wherein :

- the adapter (20) comprises a first memory (25) containing a conversion program (15) between the higher level protocol and a lower level protocol, that can be downloaded from the higher level equipment (30) and executed by the processing unit (21) in the adapter (20),

- the adapter (20) comprises a second non-volatile memory (26) containing a resident driver program (16) that can be executed by the processing unit (21) in order to initialise communication with the higher level equipment (30) using the higher level communication protocol and download the conversion program (15) into the first memory (25).

2. Adapter device according to claim 1, wherein the first memory (25) of the adapter (20) is a volatile memory.

3. Adapter device according to claim 2, wherein the first memory (25) of the adapter (20) contains a buffer memory area (17) used by the conversion program

(15) to adapt to asynchronism between the higher level and lower level protocols.

4. Adapter device according to claim 3, wherein the conversion program (15) executed by the processing unit (21) stores messages received from a lower level equipment (40) in the buffer memory area (17) before passing them onto the higher level equipment (30).

5. Adapter device according to claim 3, wherein the conversion program (15) executed by the processing unit (21) stores messages received from the higher level equipment (30) in the buffer memory area (17) before passing them onto a lower level equipment (40).

6. Adapter device according to claim 1, comprising a lower level connecting cable (14) between the lower level interface (24) of the adapter (20) and the lower level interface (42) of the lower level equipment (40), wherein the lower level connecting cable (14) contains integrated recognition means, detectable when the cable (14) is connected to the lower level interface (24) of the adapter (20), enabling the processing unit (21) of the adapter (20) to determine a complete identifier (18b) or a partial identifier (18a) of the lower level protocol using the resident driver program (16).

7. Adapter device according to claim 6, wherein the complete identifier (18b) or the partial identifier (18a) of the lower level protocol is memorized in the first memory (25) of the adapter (20).

8. Adapter device according to claim 1, wherein the device also comprises a storage area (35) in the higher level equipment (30) in order to store one or several conversion programs (15, 15') between the higher level protocol and a lower level protocol, that

can be downloaded in the first memory (25) of the adapter (20).

9. Adapter device according to claim 8, wherein the higher level equipment (30) comprises at least one lower level protocol driver (33) and at least one peripheral driver (34) supporting a serial communication interface, such that the lower level protocol driver (33) communicates with the peripheral driver (34) through this serial communication interface.

10. Adapter device according to claim 9, wherein the peripheral driver (34) of the higher level equipment (30) uses different communication channels as a function of the criticality of the messages to be transmitted, to exchange messages with the resident driver program (16).

11. Adapter device according to claim 1, wherein the USB protocol is used as the higher level communication protocol.

12. Adapter device according to claim 11, wherein the adapter (20) is supplied by the USB interface of the higher level equipment (30).

13. Adapter device according to claim 1, wherein the higher level communication protocol is the BLUETOOTH protocol.

14. Adapter device according to claim 1, wherein the higher level communication protocol is a protocol conform with the IEEE 1394-1995 standard.

15. Adapter device according to claim 1, wherein the lower level communication protocol is one of the ModBus, ModBus+, Uni-Telway or any other protocol using an RS-232, RS-485, RS-422 or current loop as the physical layer.

16. Adapter device according to claim 1, wherein the lower level communication protocol is a protocol based on the Ethernet and TCP/IP standards.

17. Adapter device according to claim 1, wherein the lower level communication protocol is selected from a group composed of the FIP, CAN, CANopen, Interbus-S, DeviceNet protocols.

18. Adapter device according to claim 1, wherein the lower level communication protocol is a communication protocol based on the USB protocol.

19. Configuration process used in an adapter device according to one of the previous claims, the process comprising :

• a recognition step (R) in which the adapter (20) determines and memorizes a partial identifier (18a) or a complete identifier (18b) of a lower level protocol starting from means of recognising the lower level connecting cable (14) connected to the adapter (20),

• a first identification step (I1) in which the adapter (20) communicates with the higher level equipment (30) using the higher level communication protocol to transmit the partial identifier (18a) or the complete identifier (18b) of the lower level protocol, to the higher level equipment,

• a first downloading step (T1) in which the higher level equipment (30) downloads a first conversion program (15) between the higher level protocol and the lower level protocol, into the adapter (20), corresponding to the partial identifier (18a) or the complete identifier (18b) of the transmitted lower level protocol.

20. Configuration process according to claim 19, wherein, when the lower level protocol identifier

transmitted to the higher level equipment (30) during the first identification step (I1) is a partial identifier (18a), the process comprises the following additional steps :

- a learning step (A) in which the adapter (20) communicates with the lower level equipment (40) using the first conversion program (15) downloaded during the first downloading step (T1) in order to define and memorize a complete identifier (18b) of the lower level protocol,
- a second identification step (I2) in which the adapter (20) communicates with the higher level equipment (30) to transmit this complete identifier (18b) to the higher level equipment,
- a second downloading step (T2) in which the higher level equipment (30) downloads a second conversion program (15') between the higher level protocol and the lower level protocol, into the adapter (20), corresponding to the complete identifier (18b) of the lower level protocol.

21. Configuration process according to claim 19, wherein, when the lower level connecting cable (14) is previously connected to the adapter (20), the process is started when the adapter (20) is connected to the higher level equipment (30) or at the request of the adapter (20).

22. Configuration process according to claim 19, wherein, when the adapter (20) is previously connected to the higher level equipment (30), the process is started when the lower level connecting cable (14) is connected to the adapter (20).

FIGURE 3	
Réception	Reception
Emission	Transmission
FIGURE 4	
Réception	Reception
Emission	Transmission